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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is included. (AG)

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TECHNICAL REPORT

ON

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

VETERINARIAN O-34.10

B-299 or S-58

U. S. Employment Service in
Cooperation with
Minnesota and Pennsylvania State Employment Services

U. S. DEPARTMENT OF LABOR
Bureau of Employment Security
Washington 25, D. C.
October 1954

GATB #826C, 706 and 821
June 1952 and Feb. 1954

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY FOR VETERINARIAN 0-34.10

B-299 or S-58

Summary

The General Aptitude Test Battery, B-1001, was administered to two samples of seniors in schools of veterinary medicine. The first sample consisted of 33 male students at the University of Pennsylvania, Philadelphia, Pennsylvania, to whom the GATB was administered in March 1951. The second sample consisted of 39 male students at the University of Minnesota, St. Paul, Minnesota, who were tested in October 1952. Grade point ratios were used as the criterion for the Pennsylvania sample, and honor point ratios were used as the criterion for the Minnesota sample. The two samples were combined to make a total sample of 72 students.

On the basis of the statistical results of the combined study, as well as the statistical results of each experimental sample taken individually and the job analyses, the following aptitudes were found to be significant: (G) Intelligence, (S) Spatial Aptitude and (A) Aiming.

The GATB, B-1001, was also administered to a sample of 50 freshmen at the School of Veterinary Medicine, the University of Minnesota, St. Paul, Minnesota. Although significant correlation coefficients were not obtained for the sample, the aptitude score profile tended to substantiate the findings based on the senior samples with respect to significant aptitudes and cutting scores.

GATB Norms for Veterinarian 0-34.10 - B-299 or S-58

Table I shows, for B-1001 and B-1002, the minimum acceptable score for each aptitude included in the test norms for Veterinarian.

TABLE I

Minimum Acceptable Scores on B-1001 and B-1002 for B-299 or S-58

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
G	CB-1-H CB-1-I CB-1-J	115	G	Part 3 Part 4 Part 6	110
S	CB-1-F CB-1-H	110	S	Part 3	105
A	CB-1-C CB-1-K	100	K	Part 8	100

Effectiveness of Norms

The data in Table IV-C indicate that 13 of the 18 poor students, or 72% of them, did not achieve the minimum scores established as cutting scores on the recommended test norms. Moreover, 42 of the 47 students who made qualifying test scores, or 89%, were good students.

TECHNICAL REPORT

I. Problem

This study was conducted to determine the best combination of aptitudes and minimum scores to be used as norms on the General Aptitude Test Battery for the occupation of Veterinarian 0-34.10.

II. Sample

This study is based on two samples: one sample consists of 33 students at the University of Pennsylvania; and the other sample consists of 39 students at the University of Minnesota.

A. Pennsylvania Sample

In March 1951, the entire GATB was administered to 33 male students at the School of Veterinary Medicine of the University of Pennsylvania, Philadelphia, Pennsylvania. All students who were to be graduated in June 1951 were included in the sample. No students in that class were eliminated from the sample.

The veterinary course at the school is a four year course with the requirement of a two year pre-veterinary course in an accredited college. The pre-veterinary course, which consists of 60 semester credits, includes the following:

English
General Inorganic Chemistry
Organic Chemistry
Physics
Zoology
Botany
Social Science

It is assumed that 6 hours of college mathematics has been taken by these students. A minimum of 6 years of study beyond high school is required to become a Veterinarian. However, in this group of students, education beyond high school ranges from a minimum of 6 years to a maximum of 9 years. Some students were unable to start in the Veterinary School after two years of college because of crowded conditions, and therefore continued their college education while waiting to enter Veterinary School.

B. Minnesota Sample

In October 1952, the entire GATB was administered to 44 male students at the School of Veterinary Medicine, the University of Minnesota, St. Paul, Minnesota. There were four additional students in their senior year who were absent on the date of testing. Of the 44 students tested, five were excluded from the sample because of incomplete criterion data, leaving a final experimental sample of 39 students.

Requirements for admission to the School of Veterinary Medicine are two years (90 quarter hours) of pre-veterinary course work with a scholastic honor point ratio of at least 1.5 (halfway between a "B" and a "C" average) in veterinary subjects. Additional selection is based upon overall scholastic standing in pre-veterinary studies as well as factors of interest and character.

Since there are limited teaching facilities, the number of students accepted each year is restricted. There are approximately twice as many applications annually as there are students accepted.

Table II-A shows the means, standard deviations, ranges, Pearson product-moment correlations with the criterion, and the standard errors of correlation for age and education for the Pennsylvania sample. Table II-B shows the mean, standard deviation, range, Pearson product-moment correlation with the criterion, and the standard error of correlation for age for the Minnesota sample. Data were not obtained on education for this sample; only a small proportion of students had other than two years of pre-veterinary training prior to entering the School of Veterinary Medicine. Table II-C shows the mean, standard deviation, and range for age for the combined sample.

TABLE II-A

Means (M), Standard Deviations (σ), Ranges, Pearson Product-Moment Correlations with the Criterion (r), and the Standard Errors of Correlation (σ_r) for Age and Education

Veterinarian 0-34.10

Pennsylvania Sample
N = 33

	M	σ	Range	r	σ_r
Age (years)	28.5	4.5	23-43	-.022	.174
Education (years)	18.5	.9	18-21	-.107	.172

TABLE II-B

Mean (M), Standard Deviation (σ), Range, Pearson Product-Moment Correlation with the Criterion (r), and the Standard Error of Correlation (σ_r) for Age

Veterinarian 0-34.10

Minnesota Sample
N = 37*

	M	σ	Range	r	σ_r
Age (years)	27.0	2.9	22-34	-.360	.143

*Age data were not available for two students in this sample.

TABLE II-C

Mean (M), Standard Deviation (σ), and Range for Age

Veterinarian O-34.10
Combined Sample
N = 70*

	M	σ	Range
Age (years)	27.7	3.8	22-43

*Age data were not available for two students in the Minnesota sample.

No significant relationship is apparent between age or education and the criterion for the Pennsylvania sample. A negative relationship, statistically significant at the 5 percent level, was found between age and the criterion for the Minnesota sample. However, this did not warrant correcting the criterion for age. The two sub-samples did not differ greatly with respect to age. None of the students had had any job experience as veterinarians.

III. Job Description

Job Title: Veterinarian O-34.10

Job Summary: Studies and treats diseases of animals: Analyzes disease or injury and treats animal surgically or medically. Removes tumors and cures colds, pneumonia, and distemper. Tests dairy herds for tuberculosis and inoculates animals against disease, such as hogs against cholera and dogs against rabies. Performs autopsies on dead animals to determine cause of death. Inspects animals intended for human food before or after slaughtering. Advises on care and breeding of animals.

A. Pennsylvania Sample

Course Description: Grades made by students in the courses listed below served as a basis for the criterion for this study.

General and Special Anatomy

Lectures are devoted to a systematic presentation of general anatomy. In the laboratory students are required to study the following:

Histology
Embryology
Comparative and Applied Anatomy
General and Special Bacteriology
Imminology
Milk Hygiene
Meat Hygiene
Physiological Chemistry
Jurisprudence and Ethics
Identification, Soundness and Business Methods

Clinical Orientation
Physical Diagnosis
Poultry Diseases
Diseases of the respiratory, digestive, urinary, circulation and nervous systems
Poisonings, skin diseases, infectious diseases and history of veterinary medicine
Diseases of small animals
Clinical Instruction
Parasitology
General Pathology
Histopathology
Systemic Pathology
Pathology of Infectious Diseases
Special Pathology
Postmortem Pathology
Clinical Pathology
Animal Physiology
Advanced Physiology
Pharmacology
Pharmaco Therapeutics
Radiology
General Surgery
Special Surgery
Surgical Exercise
Orthopedic Exercises
Surgical Clinic for Large Animals
Obstetrics
Lodology

The Field Services - Sections of the Senior Class, accompanied by a member of the faculty, receive practice and training in the application of veterinary science in the Philadelphia Field Service and the Media Field Service.

The Philadelphia Field Service which is a large animal practice, is conducted from the school. Alternating groups of three senior students live in the hospital dormitory for weekly periods. They are on 24 hour duty to accompany a clinician on calls to farms and stables in and around the city. Many of these calls are in consultation with other veterinarians, thus providing opportunity for students to become acquainted with a number of unusual cases. These students also receive training in the operation of a hospital during this period of residence.

The Media Field Service is a country practice, with headquarters at the Media Training Station, Media, Pennsylvania. Alternating groups of three students live at the station for weekly periods, where they engage in examining and treating all types of farm animals in the surrounding territory. This Field Service gives them a basic training in the operation of a large animal practice.

The combined experience of the two Field Services amounts to six weeks for each student.

Hospital Clinics - daily clinical experience and instruction are provided for the members of the fourth-year class. Three separate clinics and a demonstration in post-mortem examinations are conducted daily, from 9 to 11 a.m., and a section of the senior class attends the clinics and demonstrations alternately, so that during the session each student has two periods in each clinic and in the postmortem room. Fourth year students are placed directly in charge of cases, and under the direction of the clinicians, keep the clinical records, administer the medicines, attend to surgical dressing; in the surgical clinic they are allowed to perform operations under the supervision of the professor, to the extent that this can be done with perfect safety to the animal. The large number of animals in the wards of the hospital, and those from the extensive free dispensary service of the hospital treated at the clinic, furnish abundant material for clinical lectures and practical instruction.

B. Minnesota Sample

The courses listed below are required in the professional curriculum of the School of Veterinary Medicine:

First Year

Principles of Genetics
Veterinary Gross Anatomy
Veterinary Neuroanatomy
Veterinary Microscopic Anatomy and Embryology
Physiological Chemistry

Second Year

Veterinary Bacteriology
Animal Physiology
Veterinary Pathology
Veterinary Parasitology
Veterinary Clinical Diagnosis
Introduction to Pharmacology
Poultry Nutrition and Feeding

Third Year

General Experimental Pharmacology
Veterinary Surgical Anatomy
Veterinary Clinical Pharmacology
Veterinary Clinical Pathology
Clinical Conference
Principles of Veterinary Surgery
Special Veterinary Surgery
Large Animal Medicine
Small Animal Medicine
Clinical and Laboratory Practice
Veterinary Obstetrics and Problems of Animal Reproduction
Livestook Feeding

Fourth Year

Poultry Diseases
Dairy Hygiene
Veterinary Public Health
Meat Hygiene
Diseases of Fur-Bearing Animals
Veterinary Jurisprudence and Business Methods
Clinical Conference
Infectious Diseases of Domestic Animals
Small Animal Medicine
Clinical and Laboratory Practice
Veterinary Obstetrics and Problems of Animal Reproduction
Veterinary Radiology
Animal Diseases and Poisonous Plants
Milk Production and Secretion

IV. Experimental Battery

All of the tests of the GATB, B-1001, were administered to both samples.

V. Criterion

A. Pennsylvania Sample

The criterion for this sample consists of the grade-point ratio of each student. The general group standing of a student and consequently his rank in his class is determined by multiplying the numerical grade reported for each course by the number of hours per week that the course is given, and then dividing the sum of the products by the sum of the multipliers (total number of hours). The quotient indicates the standing of each student. All the courses described in Section III-A were included. The sample was ranked according to class standing and linear scores based on conversions of the ranks were assigned to the students. The linear scores were used for test validation purposes.

B. Minnesota Sample

Honor point ratio's (H.P.R.'s) were calculated for all course work taken during the entire four year sequence. Each student received 3 honor points for each credit of "A," 2 honor points for each "B," and 1 for a "C." The total number of honor points for each student were divided by the total number of credits taken to obtain his H.P.R. The distribution of H.P.R.'s ranged from 1.11 to 2.71, with a mean of 1.73 and a standard deviation of 1.11.

VI. Statistical and Qualitative Analysis

Tables III-A and III-B show the means, standard deviations, Pearson product-moment correlations with the criterion, and the standard errors of correlation for the aptitudes of the GATB for the Pennsylvania and Minnesota samples, respectively. Table III-C shows the means and standard deviations for the aptitudes of the GATB for the combined sample.

The means and standard deviations of the aptitudes are comparable to general population norms with a mean of 100 and a standard deviation of 20.

TABLE III-A

Means (M), Standard Deviations (σ), Pearson Product-Moment Correlations with the Criterion (r), and Standard Errors of Correlation (σ_r) for the Aptitudes of the GATB

Veterinarian 0-34.10
Pennsylvania Sample

N = 33

Aptitudes	M	σ	r	σ_r
G-Intelligence	131.9	12.0	.295	.159
V-Verbal Aptitude	127.5	15.6	.334	.155
N-Numerical Aptitude	124.9	10.9	.139	.171
S-Spatial Aptitude	120.0	14.0	.103	.172
P-Form Perception	109.7	15.2	-.022	.174
Q-Clerical Perception	111.1	14.5	.268	.162
A-Aiming	111.4	10.5	.393*	.147
T-Motor Speed	111.1	10.0	.151	.170
F-Finger Dexterity	113.0	14.4	-.047	.174
M-Mamual Dexterity	117.3	18.3	-.004	.174

*Significant at the .05 level.

TABLE III-B

Means (M), Standard Deviations (σ), Pearson Product-Moment Correlations with the Criterion (r), and Standard Errors of Correlation (σ_r) for the Aptitudes of the GATB

Veterinarian 0-34.10
Minnesota Sample

N = 39

Aptitudes	M	σ	r	σ_r
G-Intelligence	132.6	10.2	.305	.145
V-Verbal Aptitude	120.3	12.4	.322*	.144
N-Numerical Aptitude	129.1	10.1	.197	.154
S-Spatial Aptitude	127.8	16.1	.014	.160
P-Form Perception	120.9	14.6	.124	.158
Q-Clerical Perception	119.1	14.9	.197	.154
A-Aiming	110.8	14.9	.015	.160
T-Motor Speed	107.9	21.7	.004	.160
F-Finger Dexterity	103.3	16.3	.088	.159
M-Manual Dexterity	109.4	19.2	.023	.160

*Significant at the .05 level.

TABLE III-C

Means (M) and Standard Deviations (σ) for the Aptitudes of the GATB

Veterinarian 0-34.10
Combined Sample

N = 72

Aptitudes	M	σ
G-Intelligence	132.3	11.0
V-Verbal Aptitude	123.6	14.4
N-Numerical Aptitude	127.1	10.6
S-Spatial Aptitude	124.3	15.6
P-Form Perception	115.8	15.9
Q-Clerical Perception	115.4	15.2
A-Aiming	111.1	13.1
T-Motor Speed	109.3	17.4
F-Finger Dexterity	107.7	16.2
M-Manual Dexterity	113.0	19.2

The statistical results were interpreted in the light of job analyses data. The job analyses indicated that the following aptitudes measured by the GATB appeared to be important for the occupation of Veterinarian:

Intelligence (G) - required in order to learn the various subjects in the curriculum as well as in all phases of the Veterinarian's work requiring judgment.

Verbal Aptitude (V) - necessary to acquire an understanding of technical terminology used in the course work.

Numerical Aptitude (N) - necessary for mathematical and scientific course work, such as chemistry and physics.

Spatial Aptitude (S) - required in such courses as physiology and biology in order to understand and visualize the anatomy of animals.

Some motor ability or dexterity is required in order to perform operations, autopsies, and administer injections.

The aptitude profiles of the two samples are quite similar with respect to the aptitudes indicated as significant in the job analyses.

From Table III-A it may be seen that Aptitudes G, V, N, and S have the highest mean scores for the Pennsylvania sample. All the standard deviations are below the general population norm of 20; this sample exhibits the greatest homogeneity on Aptitudes N, A and T. Aptitude A correlates significantly with the criterion at the .05 level. No other aptitudes show significant correlation with the criterion of the Pennsylvania sample.

From Table III-B it may be seen that Aptitudes G, N, and S have the highest mean scores for the Minnesota sample. All the standard deviations, with the exception of the sigma for Aptitude T, are below the general population norm of 20; this sample shows the most homogeneity on Aptitudes G and N. Aptitude V correlates significantly with the criterion at the .05 level. No other aptitudes show significant correlation with the criterion of the Minnesota sample.

The data in Table III-C for the combined sample show that Aptitudes G, N, and S have the highest mean scores. All the standard deviations are below the general population norm of 20; the combined sample shows greatest homogeneity on Aptitudes N and A.

Aptitudes G, S, and A were selected for inclusion in the test norms. Aptitudes G and S had high means and were significant on the basis of the job analyses. Aptitude A correlated significantly with the criterion for the Pennsylvania sample, and is a measure of motor ability which appears to be warranted on the basis of the job analyses data. Aptitude A showed the highest mean score among the dexterity measures for the Minnesota sample; its standard deviation is smaller than those of the other dexterity measures for the combined sample.

Although Aptitudes V and N showed evidence of importance for this occupation, they were not selected for inclusion in the norms. The inclusion of Aptitude V decreased the selective efficiency of the norms for the Pennsylvania sample. The inclusion of Aptitude N decreased the selective efficiency of the norms for the Minnesota sample, and increased the percent of the total sample failing the norms to a higher than desirable level.

The minimum scores for Aptitudes S and A were set one sigma below the mean of the combined sample and rounded to the nearest five-point score levels. For Aptitude G, the cutting score was set at the five-point score level nearest to one sigma below the mean of the combined sample and then adjusted to the next lower five-point score level in order to obtain better selective efficiency. This resulted in critical scores of 115, 110, and 100 for Aptitudes G, S and A respectively.

For the purpose of evaluating the norms by means of the tetrachoric correlation and Chi Square techniques, the criteria were dichotomized placing approximately 25 percent of each sample in the low criterion group. It was decided to place one-fourth rather than a higher proportion of each sample in the low group, since the students were in their senior year and completing the course work successfully. Students in each high criterion group were designated as "good students" and those in each low criterion group were designated as "poor students."

Tables IV-A and IV-B show the discriminative value of the norms for the Pennsylvania and Minnesota samples, respectively. Table IV-C shows the discriminative value of the norms for the combined sample.

TABLE IV-A

Relationship Between Test Norms Consisting of Aptitudes G, S, and A with Critical Scores of 115, 110, and 100, respectively and the Criterion for the Pennsylvania Sample

Veterinarian 0-34.10
N = 33

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Students	7	18	25
Poor Students	6	2	8
Total	13	20	33

$r_{tet} = .67$ $X^2 = 3.812$

$\sigma_{r_{tet}} = .30$ $P/2 < .05$

The data in the above table indicate a significant relationship between the test norms and the criterion for the Pennsylvania sample.

TABLE IV-B

Relationship Between Test Norms Consisting of Aptitudes G, S, and A with Critical Scores of 115, 110, and 100, respectively and the Criterion for the Minnesota Sample

Veterinarian 0-34.10
N = 39

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Students	5	24	29
Poor Students	7	3	10
Total	12	27	39

$r_{tet} = .75$ $X^2 = 7.397$

$\sigma_{r_{tet}} = .29$ $P/2 < .005$

The data in the above table indicate a significant relationship between the test norms and the criterion for the Minnesota sample.

TABLE IV-C

Relationship Between Test Norms Consisting of Aptitudes G, S, and A with Critical Scores of 115, 110, and 110, respectively and the Criterion for the Combined Sample

Veterinarian 0-34.10
N = 72

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Students	12	42	54
Poor Students	13	5	18
Total	25	47	72

$r_{tet} = .71$ $\quad X^2 = 12.766$

$\sigma_{r_{tet}} = .21$ $\quad P/2 < .0005$

The data in the above table indicate a significant relationship between the norms and the criterion for the combined sample.

Data were also available for a sample of 50 freshmen at the School of Veterinary Medicine, the University of Minnesota. The aptitude profile of this sample substantiated the findings based on the senior samples with respect to significant aptitudes (G, S, A) and cutting scores, although no significant validity coefficients were obtained for the freshman sample. The group appeared to be relatively select and homogeneous. It is probable that increasingly higher standards in the selection of students for admission to the school restricted the range and tended to depress the obtained correlation coefficients.

VII. Conclusions

On the basis of mean scores, standard deviations, correlation coefficients, job analyses data and their combined predictive efficiency, it is recommended that Aptitudes G, S, and A with minimum scores of 115, 110, and 100, respectively be used as B-1001 norms for Veterinarian 0-34.10. Equivalent B-1002 norms consist of G-110, S-105, and K-100.